

PB-214 206

DEVELOPMENT OF A COMPREHENSIVE WATER
POLLUTION CONTROL PROGRAM FOR THE RED
RIVER OF THE NORTH, SOURIS, AND RAINY
RIVER BASINS

Federal Water Quality Administration
Washington, D. C.

1972

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

1 67.2:
R25/4

2: R 25/4

PB 214 206

DEVELOPMENT OF A COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM
FOR THE
RED RIVER OF THE NORTH, SOURIS
AND RAINY RIVER BASINS

NATIONAL TECHNICAL
INFORMATION SERVICE

I 67.2: U.S. Interior
Federal Water Quality Administration
General Publications

R25/4 Development of a Comprehensive Water Pollution
Control Program f/the Red River of the North,
Souris and Rainy River Basins.

Dated 196?

Varying Title - Development of a Comprehensive
Water Pollution Control Program f/ the
Missouri-Souris Red River Basins.

DEVELOPMENT OF A COMPREHENSIVE WATER
POLLUTION CONTROL PROGRAM
FOR THE
RED RIVER OF THE NORTH, SOURIS, AND RAINY RIVER BASINS

Date ?

NTIS

National Technical Information Service

U. S. DEPARTMENT OF COMMERCE/Springfield, Va. 22151
Document Sales Telephone: (703) 321-8543

GUIDANCE TOOLS FOR CONTRIBUTORS

The following guidance tools are available to assist you in preparing your reports for processing by the National Technical Information Service (NTIS).

To order, please indicate the number of copies wanted and RETURN THIS ORDER BLANK to NTIS, U.S. Department of Commerce, Springfield, Virginia 22151. Prepayment is required.

No. Copies

- _____ A. COSATI Guidelines to Format Standards for Scientific and Technical Reports. ORDER: PB-180 600. Price: \$3.00.
- _____ B. Standard for Descriptive Cataloging of Government Scientific and Technical Reports. ORDER: AD-641 092. Price: \$3.00.
- _____ C. Abstracting Scientific and Technical Reports of Defense Sponsored RDT/E. ORDER: AD-667 000. Price: \$3.00.
- _____ D. Descriptive Cataloging Guide AEC. ORDER: TID-4577-REV 3. Price: \$3.00.
- _____ E. Guide to the Processing, Storage, and Retrieval of Bibliographic Information at the NASA Scientific and Technical Information Facility. ORDER: N66-34085. Price: \$3.00.
- _____ F. COSATI Subject Category List. ORDER: AD-612 200. Price: \$3.00.
- _____ G. Federal Microfiche Standards. ORDER: PB-167 630. Price: \$3.00.

I. Thesaurus of Engineering and Scientific Terms (TEST). Order from Engineers Joint Council, 345 East 47th Street, New York, New York 10017. Price: \$25.00 hard cover, \$19.50 flexible cover.

- ☐ Check or money order payable to NTIS is enclosed in the amount of \$_____.
- ☐ Coupons enclosed.
- ☐ Charge to my Deposit Account No. _____.

Name _____

Address _____

City _____ State _____ ZIP Code _____

FORM NTIS-31 (9-70)

A COMPREHENSIVE PROGRAM FOR WATER POLLUTION CONTROL

The objectives of the program are to restore and preserve the quality of surface and ground water to protect public health and to meet the public's desires and expectations for clean water. The program will meet these objectives in a highly efficient manner through systematic application of a combination of water pollution control measures. These measures include: (1) elimination or reduction of pollution at its source; (2) removal of polluting materials from waste water discharges by treatment methods; (3) control of times of release of waste waters to minimize pollutional effects; and (4) after application of treatment and control at the source, by regulation of streamflow for water quality control.

In the development of this program:

1. Desires and expectations of the public for clean water are identified by consultation with those individuals, industries, municipalities, civic groups, and public officials concerned with the quality of water in the basin.
2. Through an exchange of information between the water users groups and the project staff, public desires are translated into measurable water quality characteristics and water quality goals are established.
3. Engineering, scientific, and economic technology is applied to determine blends of alternative methods of achieving these quality goals and to evaluate their relative effectiveness, dependability, cost, and acceptance.
4. Means and measures for controlling pollution and conserving water quality are implemented as rapidly as possible through coordinated participation of water users, pollution control authorities, construction agencies, and other interest groups.

This program will be developed in cooperation with other Federal agencies, the States, and industries and municipalities concerned.

DEVELOPMENT OF A COMPREHENSIVE WATER POLLUTION CONTROL PROGRAM
FOR THE
RED RIVER OF THE NORTH, SOURIS, AND RAINY RIVER BASINS

Authority

The Federal Water Pollution Control Act requires that the Secretary of the Interior develop comprehensive water pollution control programs in cooperation with other Federal, State, interstate, and local water pollution control agencies for eliminating or reducing water pollution in surface and underground sources to maintain a water quality suitable for all beneficial purposes. The Act also requires that, in planning any Federal reservoir, consideration must be given to storage for flow regulation for water quality control. The Secretary of the Interior must advise the appropriate Federal construction agencies on the need for and the value of such storage. The Secretary of Health, Education and Welfare will advise relative to the health aspects of the need for and value of the inclusion of storage for regulation of streamflow for water quality control at Federal reservoirs.

Study Area

The Red River of the North, Souris, Rainy River Basins study area encompasses the portion of the United States that is the watershed of the Red River of the North, the Souris, and Rainy River systems. These river systems drain the northern and eastern portions of North Dakota, and western and northern portions of Minnesota. A small area

A COMPREHENSIVE PROGRAM FOR WATER POLLUTION CONTROL

The objectives of the program are to restore and preserve the quality of surface and ground water to protect public health and to meet the public's desires and expectations for clean water. The program will meet these objectives in a highly efficient manner through systematic application of a combination of water pollution control measures. These measures include: (1) elimination or reduction of pollution at its source; (2) removal of polluting materials from waste water discharges by treatment methods; (3) control of times of release of waste waters to minimize pollutional effects; and (4) after application of treatment and control at the source, by regulation of streamflow for water quality control.

In the development of this program:

1. Desires and expectations of the public for clean water are identified by consultation with those individuals, industries, municipalities, civic groups, and public officials concerned with the quality of water in the basin.
2. Through an exchange of information between the water users groups and the project staff, public desires are translated into measurable water quality characteristics and water quality goals are established.
3. Engineering, scientific, and economic technology is applied to determine blends of alternative methods of achieving these quality goals and to evaluate their relative effectiveness, dependability, cost, and acceptance.
4. Means and measures for controlling pollution and conserving water quality are implemented as rapidly as possible through coordinated participation of water users, pollution control authorities, construction agencies, and other interest groups.

This program will be developed in cooperation with other Federal agencies, the States, and industries and municipalities concerned.

in northern South Dakota is tributary to these river systems. The Rainy River forms part of the international boundary between the United States and Canada. All three rivers flow into Canada (Figure 1).

Problem Significance

The streams and aquifers of the Red River of the North, Souris, and Rainy Rivers drainage basins are important sources of water, serving all phases of the area's economy, providing for such needs as water supply, irrigation, recreation, transport of wastes, etc. Multi-purpose use and reuse have resulted in a number of major water quality problems. Increasing demands will require additional reuse of the waters.

The utilization of the waterways for disposal of wastes has created localized pollution problems, with dissolved oxygen deficits, and bacterial build-ups. A large majority of the municipalities and industrial plants in the basin have treatment works in operation or under construction, but many of the plants are overloaded. Treated wastes discharged and surface runoff from agricultural lands have increased the algal nutrients in the streams.

Agriculture is a major occupation and much of the land is irrigated. Irrigation return flows are degrading stream quality. Salts leached from the soils have increased the total dissolved solids far in excess of desirable concentrations. Devils Lake and Stump Lake in North Dakota, which have no natural outlet, are filled with highly mineralized water.

These lakes will be flushed to the streams if the planned expansion of irrigation by diversion of water from the Garrison Reservoir is placed in operation.

There are a number of food processing plants in the area, including potato processing plants, sugar beet refineries, meat processing plants and plants for dairy and other products. The handling of their waste is further complicated by the severe weather conditions which are encountered during the winter months.

The overall problem to be resolved, is that of providing a water quality which will meet present and future local use requirements in such a manner as to permit a continued high level of public health, economic and recreational opportunities throughout the Red River of the North, Souris, and Rainy River Basins.

Primary Functions of the Project

Many data concerning water quality and pollution have been collected in the Red River of the North, Souris, and Rainy River Basins and are available for use in the study. The majority of these data, focused on specific or localized problems, were used in the development of reports concerning water quality and pollution studies by State and Federal agencies. In most cases, these reports have not evaluated the effects on water quality for specific beneficial uses of the resources development programs, nor have they developed the predictive techniques necessary, under a variety of development schemes, to arrive at reasonable estimates of future water quality problems. The Comprehensive Water Pollution Control Program will be directly involved with these planning aspects.

Available data will be placed in the STORET system to evaluate the adequacy of the existing data required from recent and earlier studies of the area. Studies will be coordinated with the activities of the International Joint Commission's work in the Red River of the North area, and with the activities of the other State and Federal agencies. The development of the Comprehensive Program will require specific investigations where adequate data are not available.

Where indicated, studies of existing water supplies, waste treatment facilities, economic and population data, stream dynamics, and water use-waste load relationships will be undertaken in cooperation with local, State, interstate and other Federal agencies having the responsibility for water pollution control and water resources developments.

A water users committee made up of representatives of quality and quantity interests will be established to assist in formulating water use goals, quantifying benefits and cost factors in evaluating alternative combinations of pollution control measures.

The desires and expectations of the local public for water use will be identified through public meetings and consultation with individuals, industry, civic groups and public officials concerned with the quality of water in the study area. These desires will be translated into measurable water quality characteristics and quality goals will be established.

A mathematical model will be developed for each of the streams

which will evaluate the stream quality response to environmental changes. Considering existing pollution, areas where pollution is imminent, projections of future development with increasing water demands, water use and pollutorial loadings, the model will provide for an evaluation of determined blends of alternative methods to achieve quality goals and evaluate their relative effectiveness, dependability, costs, and acceptance.

The following specific activities are planned to supplement existing data:

Inventories - Inventories of existing water facilities will be made to provide data on the present use of surface and ground water for domestic, municipal, industrial, agricultural water supplies, irrigation and other purposes. These inventories will contain information on use, amount of water used, location of withdrawal, water supply systems, and treatment facilities.

Water pollution control inventories will provide necessary information on all sources of pollution such as location, kind, amount, and characteristics of the wastes. Sources of pollution will include combined sewer overflows, surface runoff, municipal and industrial sewer system outfalls, waste treatment facilities, and agricultural waste waters.

Economic and Population Studies - Economic projections, based on data provided by the Office of Business Economics of the Department of

Commerce will be made for the study area. A special economic study will be developed in cooperation with the Canadian government. These projections will provide a basis on which to forecast future industrial development, including projected size of plants, distribution of labor force and job opportunities. Estimates of water use and needs and types and amounts of resulting wastes of municipal growth and industrial activities will be developed for the basin.

Stream Dynamics - These studies will include detailed measurements of the present physical, chemical, and biological qualities of water of the area. Past records will be evaluated and detailed measurements made to determine the amounts, distribution and seasonal variation in quality. A computerized storage and retrieval system will be employed to make these data readily available for any given area. Hydrologic studies will be made to measure the velocity, depth, turbulence, stratification, effects of impoundments, regulating devices and other physical characteristics of the waterways.

Interpretations of these data will show cause and extent of water quality deterioration, effect of various hydraulic features on water quality and indicate where protective measures are needed to maintain suitable water quality. The implementation of a Comprehensive Water Pollution Control Program will minimize the various polluttional problems as well as provide a basis for future development.

External Promotion and Participation in Implementing the Program
Planned in the Development Phase

To accelerate efforts to promote interest and support for pollution control from existing authorities and from the subbasin communities, the following program will be implemented:

1. Promote good public relations through public meetings, special reports, talks to interest groups, and acknowledgements of actions taken.
2. Continue committee participation and keep active the established communications and working arrangements established during development phase with Federal, State, local, and special groups.
3. Technically support the States and municipalities and other pertinent entities in pollution control actions and new legislation.
4. Promote the establishment and coordinate with river basin authorities having jurisdiction to command timely response from industries, municipalities, and State and Federal agencies in charge of specific water pollution control works.

Information Analysis and Display

Information will be analyzed continuously and displayed and disseminated in meaningful form so that responsible and interested agencies and groups are continually kept abreast of the existing water quality situation. The STORET system must be continuously updated and used as a service to the river basin community, as well as to the water pollution control authority. Special and periodic reports will be made for the

benefit of water users and others that have need of information on water quality at various places in the basin. Charts, maps, and other visual aids must be updated continuously to portray adequately the existing water pollution control picture.

Federal Construction Agencies

Completion of the development phase of comprehensive programs will provide much (but not all of) background data for these studies; report review and preparation will continue.

Stream Quality Management

This function involves day-to-day management of facilities for controlling stream quality. Stream quality management includes six basic elements:

1. Continual collection of timely information on stream quality, waste loads, water uses, locations and operation of treatment plants and amounts of storage in reservoir for flow regulation. This information gathering function will require a network of automatic water quality measuring and data transmitting instruments and the continuous soliciting of pertinent information from governmental and private sources.
2. Annual, seasonal, and daily forecasts of quality. To operate rationally and efficiently, the water pollution control authorities must have up-to-date adequate forecasts of the water quality to be expected in the stream. The heart of the forecast's function is the

mathematical model of stream quality response to changes in hydrologic, pollution loads, and other environmental inputs. The execution of this function envisions the use of computers of very high storage capacity.

3. To serve their purpose, particularly during the critical periods, forecasts must be made available to concerned water users, to State and local pollution control agencies and to authorities having jurisdiction for reservoir operations. A daily bulletin will be issued to those involved directly in pollution control, and telephone communication will be used in emergencies.

4. Optimizing and decision evaluation. Having collected information to portray the existing quality situation and having utilized forecast models to predict future situations, the authorities will need to know what set of actions will produce desired water quality in an optimal phase. In essence, this entails knowledge of costs and effectiveness of alternative actions and of losses incurred by failure to meet quality goals. These relations will change continually as conditions in the basin change and advances are made in technology relating to water pollution control.

5. Decision making. It is obvious that stream quality cannot be managed unless there is a way to demand action and get desired response to carry out optimal decisions. The comprehensive programs are being developed on this premise.

6. Refinement of the system. Observation and surveillance after a decision has been made and actions have been carried out are essential to determine if the desired response in water quality was obtained. The quality forecast, or response models, can be perfected only on the

basis of experience.

Monitoring and Survey

Monitoring is needed to assure that municipal and industrial facilities are operating properly and that compact agreements or orders are being complied with. The field investigation staff required for this purpose will also conduct new surveys and investigate new problems as they occur. During the development phase, the project could measure only existing phenomena and try to project future conditions. As time passes and actuality perfects projection, there will be a continuing need to measure new phenomena, analyze samples, evaluate data, update plans and schedules.

Comprehensive Management Program

Knowledge obtained from these complex interrelated studies will give a picture of the present and past conditions of the water resources system. Estimates of future water requirements and waste discharges, based on economic and demographic studies, runoff, hydrologic features, and other data will provide a base from which remedial and protective measures required to achieve the desired objective of managing the water quality of the basin can be determined. These data will be used in the development and application of mathematical analyses or models that will provide:

1. information relative to those factors which affect water quality for different development conditions,

existing at predetermined times in a given area.

2. information relative to the effectiveness of alternative investments, permitting the selection of the least cost combinations of alternatives, which will accomplish a specific pollution control (i.e., water quality) condition.

Guidelines relating to water resource development projects, beneficial water use, treatment technology, and planning constraints will be established to assure optimum water pollution control and quality management. The Comprehensive program will be based on the projection of future conditions. The completed plan will be flexible in order to allow future generations the greatest choice of alternatives in the conservation, development and use of the water and related land resources.

Organization

A Program Field Office will be established at Grand Forks, North Dakota. Early attention will be given to the development of a model of the Red River of the North to determine not only the effects of existing pollution, but also the effects on water quality of return irrigation flows which can be expected if the Garrison Diversion Project is put in operation.

Existing data will be placed in STORET. These data will be reviewed to determine if there are any omissions in data which need to be obtained by field studies or inventories.

Portable laboratories will be used if required for field investigations. A central laboratory will be established at Headquarters in the Kansas City area.

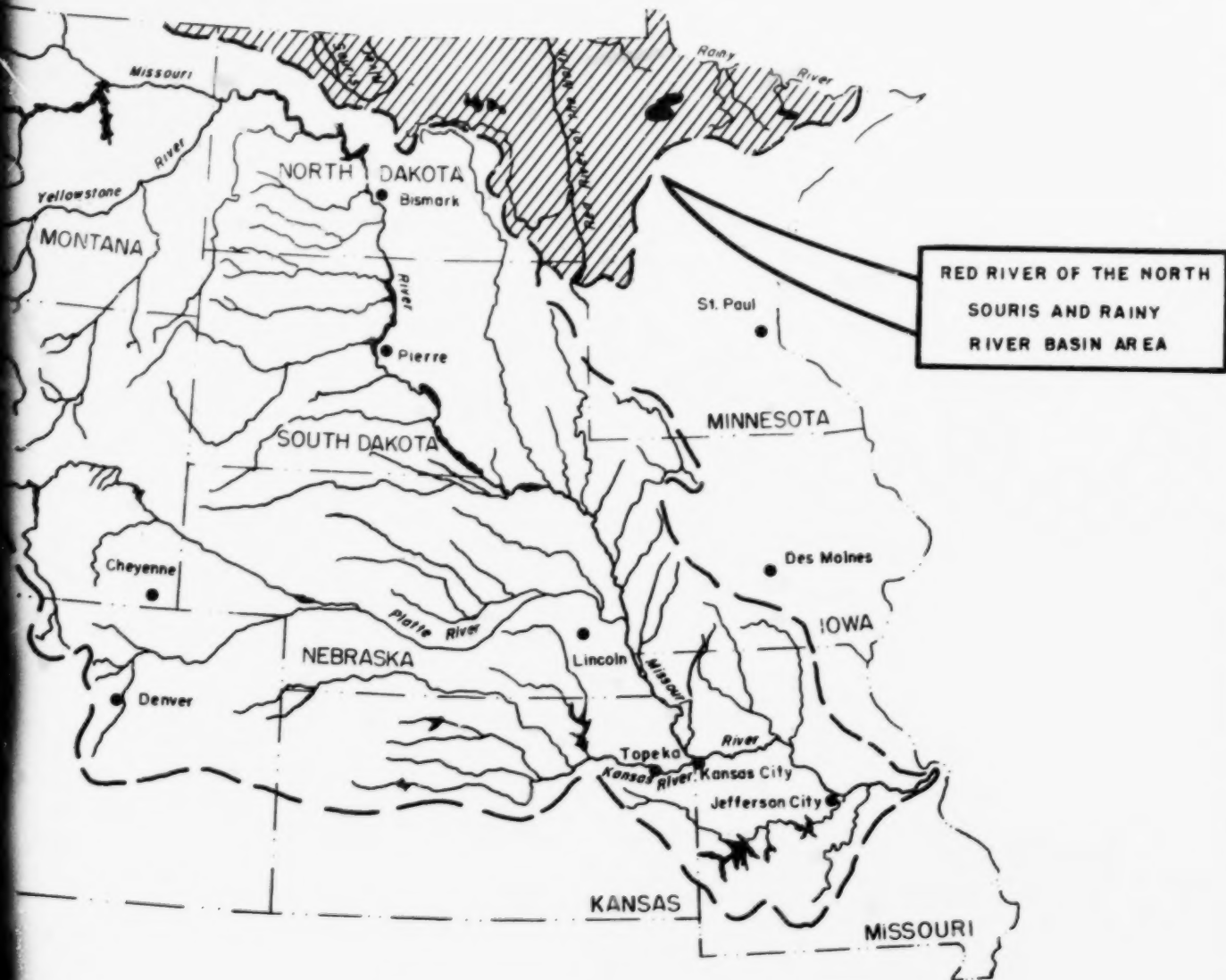
Economic studies will be conducted in cooperation with the Canadian Government.

It is envisioned that the Field Office will have a staff of five people on a full-time basis and that staff and services from the Headquarters office will supplement the operations.

A



B



MISSOURI-SOURIS-RED RIVER BASINS COMPREHENSIVE PROJECT

STUDY AREA

DEPARTMENT OF THE INTERIOR

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

MISSOURI BASIN REGION

KANSAS CITY, MISSOURI